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Rules and Directives Branch
Office of Administration
U. S. Nuclear Regulatory Commission
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SUBJECT: Public Comments on Draft Regulatory Guide DG-1096, *Transient and Accident Analysis Methods,* and Draft Standard Review Plan Section 15.0.2, *Review of Analytical Computer Codes,* (65 *Fed. Reg.* 77934)
Response to Request for Comments

PROJECT NUMBER: 689

Enclosed are the Nuclear Energy Institute's (NEI)[1] comments on draft Regulatory Guide DG-1096 and draft SRP Section 15.0.2, issued for public comment on December 13, 2000.

Draft Regulatory Guide DG-1096 and draft SRP Section 15.0.2 identify a framework for the development and review of evaluation models that may be used to analyze reactor transient and accident behavior. The draft guidance documents expand upon this framework by providing details on how individual elements of this framework should be addressed. These details rely heavily on recent review efforts involving realistic LOCA methods and call for a level of detail and development effort beyond that necessary to address any but the most sophisticated and complex analyses.

While not explicitly identified in existing regulatory guidance, the major elements of the framework identified in DG-1096 and draft SRP 15.0.2 have been used by licensees and NRC staff as part of evaluation model development and review efforts. The implementation details of this framework, by design and necessity, have varied to reflect the complexity of the analysis and underlying phenomena. Each of these

[1] NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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development and review efforts has also taken into account the level of conservatism in the models, input parameters and acceptance criteria.

The proposed guidance provided by DG-1096 and draft SRP 15.0.2 ignores the graded development and review approach that has evolved during the past 30+ years of evaluation model development and review. In its place, the guidance would direct the use of processes developed specifically for realistic LOCA analyses for all evaluation models. The impetus for such a significant change in NRC staff positions on evaluation model review is not addressed in the draft guidance or notice for comment. Similarly, the 10 CFR Part 50.109 backfit implications are not addressed in the accompanying regulatory analysis.

We recommend that NRC modify the scope and purpose of the guidance documents based on the enclosed recommendations. The regulatory analysis supporting the proposed guidance should also be revised to explicitly address the changes in NRC staff positions and the associated compliance with 10CFR 50.109 requirements.

We support NRC plans to hold a public workshop on these proposed guidance documents; tentatively scheduled for April 9. NEI is willing to assist NRC planning efforts for this workshop, which we believe will serve as a valuable forum for discussion of issues and comments on the draft guidance documents.

Please direct questions on the enclosed comments and recommendations to John Butler (202-739-8108, jcb@nei.org).

Sincerely,

Alexander Marion

JCB/maa
Enclosure

c: Mr. Norman Lauben, U. S. Nuclear Regulatory Commission
Mr. Joseph L. Staudenmeier, U. S. Nuclear Regulatory Commission
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Enclosure

Comments on Draft Regulatory Guide DG-1096, *Transient and Accident Analysis Methods*, and Draft SRP Section 15.0.2, *Review of Analytical Computer Codes*

Based upon industry review of draft Regulatory Guide DG-1096 and draft Standard Review Plan Section 15.0.2 (DSRP 15.0.2), concerns have been identified with the purpose, scope and application of the proposed guidance documents. These concerns are summarized in the following pages along with general recommendations on how these concerns can be addressed.

Recommendation 1. DG-1096 should be revised to clearly state that the guidance will be applied to realistic accident analyses and is not applicable to conservative evaluation model methodologies.

Discussion

The Introduction section of DG-1096 states that:

> *This regulatory guide is intended to provide guidance on* ***realistic accident analyses,*** *which will provide a more reliable framework for risk-informed regulation and a basis for estimating the uncertainty in understanding transient and accident behavior.* (Emphasis added)

Based upon this statement, the guidance is intended to apply to review of best-estimate or realistic[1] evaluation models. As a result, the guidance would not be applied to review of evaluation models that rely on a more "traditional" conservative evaluation model[2] approach. However, the singular application to realistic accident analyses is not cited beyond the Introduction section and there are numerous statements throughout the guidance that convey the intent to apply the guidance to all evaluation models; both realistic and conservative.

DG-1096 establishes six basic principles to follow in the process of evaluation model development and assessment. The draft guidance expands upon these principles using methods and processes that were developed to address modeling and review of highly complex thermal-hydraulic processes[3]. These methods have been utilized by NRC staff in review of best-estimate Loss of Coolant Accident (LOCA) analysis applications performed in accordance with the 1988 revision to 10CFR 50.46. The 1988 revision specifically requires that comparisons to applicable experimental data be made and that uncertainties in the

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[1] For the purpose of these comments, the terms "best-estimate" and "realistic" have the same meaning. Both terms are used to indicate that the techniques attempt to predict realistic reactor system thermal-hydraulic response. Realistic evaluation models require a comprehensive treatment of code and model uncertainties in order to provide assurance that the applicable regulatory requirements are met.

[2] For the purpose of these comments, the phrase "conservative evaluation model" is used to refer to the combination of inputs, thermal-hydraulic models, methods and assumptions applied in a conservative fashion, which, in combination with conservative acceptance criteria, provide assurance that applicable regulatory requirements are met, without requiring a comprehensive evaluation of code and model uncertainties.

[3] DG-1096, page 5, fifth paragraph:

> *"The subjects addressed in References 3-6 are complex, and the structures used to address these subjects are very detailed. The EMDAP described in this guide is also detailed, so that it can be applied to the complex events described in SRP Chapter 15"*

analysis method and inputs be identified and assessed so that the uncertainty in the calculated results can be estimated. The rigorous treatment of inputs, models and results called for in the 1988 revision to 10CFR 50.46 and associated regulatory guidance is appropriate for realistic analyses and is necessary to provide a high level of probability that the applicable criteria would not be exceeded.

Application of these detailed and prescriptive methods and processes to conservative evaluation models is not warranted and is unnecessary. The conservative evaluation models in use today have been developed, reviewed and licensed in a manner such that the data, assumptions, models and acceptance criteria together provide a highly conservative representation of accident sequences and provide a high level of probability that the applicable regulatory criteria would not be exceeded. Most of the accident sequences in which the conservative evaluation models have been applied are relatively simple from a thermal-hydraulic process standpoint and uncertainties associated with these processes are addressed in a defensibly conservative manner.

Beyond a simple statement that simpler events can be addressed in an abbreviated fashion[4], DG-1096 provides no guidance on how the six basic principles are to be addressed for conservative evaluation models. This leads to a concern that the detailed and prescriptive guidance previously applied to best-estimate LOCA evaluation models will be applied to conservative evaluation model applications.

We recommend that the scope of DG-1096 be limited to realistic accident analyses. The intent of the draft regulatory guide, as stated in the Introduction, to provide a more reliable framework for risk-informed regulation, would be maintained with this change.

Recommendation 2. **DSRP 15.0.2 should be revised and simplified to identify the basic development and review principles common to all evaluation models. Specific guidance identifying acceptable means to address each basic principle should be identified in separate regulatory guidance documents tailored to each general type of evaluation model.**

Discussion

Recognizing that DSRP 15.0.2 and DG-1096 were developed to be complementary documents, the previous discussion supporting Recommendation 1 also applies to DSRP 15.0.2 and supports Recommendation 2.

DSRP 15.0.2 includes a level of detail and prescription that is generally appropriate for realistic LOCA analyses but goes well beyond that necessary to support the review of conservative evaluation models or incremental changes to existing licensed evaluation models.

[4] DG-1096, page 5, fifth paragraph:
"The risk-importance of the event or the complexity of the problem should determine the level of detail needed to develop and assess an evaluation model. For simpler events, many of the steps in the process may only need to be addressed briefly."

The document identifies six areas of review: 1) Documentation, 2) Evaluation Model, 3) Accident Scenario Identification Process, 4) Code Assessment, 5) Uncertainty Analysis, 6) Quality Assurance Plan.

The DSRP 15.0.2 guidance supporting each of these review areas includes many specifications that are inappropriate to all but the most extensive evaluation model review applications. The discussions supporting each of the documentation package elements presumes the review is addressing a new realistic evaluation model, and provide no allowances for review of conservative evaluation models or incremental model changes. The following examples are provided for illustration of this point and are not intended to be a comprehensive set.

Section II.3, Accident Scenario Identification Process, states, "…*if the accident scenario identification process determines that a certain physical phenomenon is important to the scenario under consideration, the code must have a relatively accurate model for that phenomenon and a detailed assessment of that model must be provided."* This specification fails to acknowledge that conservative evaluation models often address key phenomena in an unrealistically conservative fashion. In some cases, a conservative approach is specified ("required") by applicable regulatory guidance.

Section II.4, Code Assessment, calls for all assessments to be performed with *"the frozen version of the evaluation model"* and that assessments performed with other versions of the evaluation model are not acceptable because even "small" changes to the evaluation model can have unintended consequences. This section, like most sections of the SRP, is focused on the review of new evaluation models. Application of this guidance to incremental changes to existing evaluation models would lead to a full reassessment of the code. These assessments, which include comparison against separate effects testing, integral effects testing, and performance of a scaling analysis, go well beyond the assessment necessary to review the acceptance of most incremental code changes (See Recommendation 4).

Section II.5, Uncertainty Analysis, calls for the conduct and review of a detailed uncertainty analysis. While it is acknowledged later in the document that for some Chapter 15 events a complete uncertainty analysis is not required, there is no guidance for the reviewer as to the level of evaluation that is necessary. Most conservative evaluation models utilize a combination of conservative inputs and models. In some cases, the conservatism is integral to the model and it is not possible to conduct "realistic" analyses to assess uncertainty. The most that can be achieved in many of these instances is an identification of the model biases and the direction of impact on key figures of merit.

We recommend that DSRP 15.0.2 be simplified to identify and discuss the basic development and review principles common to all evaluation models. References to separate guidance, identifying acceptable means to address each basic principle, would be included as part of the revised SRP section. This approach will allow each referenced regulatory guidance document to address common development and review principles while enabling the guidance to be tailored to reflect the specifics of each general type of evaluation model.

Recommendation 3. **A graded approach needs to be defined and reflected in guidance used in the development and review of evaluation models. This graded approach should provide balanced guidance, in the form of acceptable alternatives, which acknowledges the risk-importance of the analysis as well as the complexity of the thermal-hydraulic processes and associated models. The manner in which uncertainties are addressed should also be a reflection of risk-importance and complexity of the analysis.**

Discussion

As noted in the discussion supporting previous recommendations, the guidance provided in DG-1096 and DSRP 15.0.2 is heavily focused on development and review of realistic LOCA evaluation models. The phenomena associated with LOCA events are complex and present significant challenges to accurately model important physical processes. However, for most non-LOCA events, the key phenomena are less complex and the transients are significantly slower in the progression of important physical processes. This reduces the modeling challenges. The non-LOCA events, with known exceptions, are non-limiting events with lower risk-importance. While the draft guidance acknowledges these points of fact[5], the documents provide little assistance on how analysis complexity and risk-importance of an event or analysis are factored into the development and review effort.

We recommend, consistent with Recommendations 1 and 2, that the guidance in support of evaluation model development and review, be revised to include acceptable alternatives that reflect the risk-importance of the analysis as well as the complexity of the thermal-hydraulic processes and associated models.

Recommendation 4. **The guidance needs to clearly identify the process for development and NRC review of incremental changes to approved evaluation models. This process should rely, to the extent possible, on the standards in place during the original review and approval of the base evaluation model.**

Discussion

In the Introduction section to DG-1096 it is noted that the guide would be applicable to "changes to existing evaluation models." The DG-1096 and DSRP 15.0.2 guidance focus on the review of new evaluation models. Without additional guidance on how changes to existing evaluation models are to be addressed and without the graded review approach sought through Recommendation 3, application of the guidance to incremental changes would lead to a full reassessment of the base computer code models. The development and review efforts for incremental code changes would be far in excess of what is necessary or desired. Assessment tasks called for by the proposed guidance (e.g., comparison against separate effects testing, integral effects testing, and performance of a scaling analysis) go

[5] DG-1096, page 5, fifth paragraph:
"The risk-importance of the event or the complexity of the problem should determine the level of detail needed to develop and assess an evaluation model. For simpler events, many of the steps in the process may only need to be addressed briefly."

well beyond the assessment necessary to review the acceptance of most incremental code changes.

The assessment methods and processes identified in DG-1096 and DSRP 15.0.2 go well beyond the standards in place when conservative evaluation models currently in use were approved. Changes to existing evaluation models should be (to the degree possible) subject to the same standards in place when the original evaluation models were approved. DG-1096 and DSRP 15.0.2 outline detailed standards, processes and criteria developed to address realistic evaluation models and complex thermal-hydraulic phenomena. Application of these standards to incremental changes using current methods/models described in plant licensing basis documents would constitute the imposition of a new regulatory staff position that is clearly a backfit. We are not aware of any regulatory analysis that has demonstrated that any of the criteria of 10CFR 50.109, *backfitting*, are satisfied.

The guidance also needs to be revised to ensure consistency with guidance developed in support of 10CFR 50.59. Regulatory Guide 1.187, which endorses NEI 96-07, Revision 1, allows changes to existing methods without prior NRC approval, if the results of the change are "conservative or essentially the same" as the original method. Further, the NEI document allows the adoption by one licensee of methods approved by the NRC for the intended application for another licensee without prior NRC approval. Guidance in DG-1096 and DSRP 15.0.2, addressing small changes to approved models, appears to contradict this guidance and would call for NRC review and approval of all model changes.

We recommend that the guidance be revised to clearly identify the process for development and NRC review (if necessary) of incremental changes to approved evaluation models. This process should rely, to the extent possible, on the standards in place during the original review and approval of the base evaluation model.